Ch.30 CQ: 6

P: 10, 14, 16

30.P.10 100 watt light bulb

$I = 0.85\,A$

$D = 2.5\times10^{-4}\,m$

$r = 1.25\times10^{-4}\,m$

a.) $J = ?$ $\quad J = \frac{I}{A}$

I = current $\quad I = 0.85\,A$

A = Area $\quad A = \pi r^2$

$A = \pi(1.25\times10^{-4}m)^2$

$J = \frac{0.85A}{\pi(1.25\times10^{-4}m)^2}$

$J = 1.73\times10^{7}\,A/m^2$

$J = 1.73\times10^{7}\,A/m^2$

b.) $i_e = ?$ $\quad I = i_e e$

$i_e = I/e$

$I = 0.85A$ $\quad i_e = 5.31\times10^{18}\,s^{-1}$

$e = 1.602\times10^{-19}C$

$i_e = 5.31\times10^{18}\,s^{-1}$

30.P.14 $N_e = 2.0\times10^{13}\,e$

$\Delta t = 1.0\times10^{-6}\,s$

$N_e = i_e \Delta t$ $\quad I = e\,i_e$

$2.0\times10^{13}e = 1.0\times10^{-6}s\,(i_e)$ $\quad I = 1.602\times10^{-19}C\,(2.0\times10^{19}e/s)$

$i_e = 2.0\times10^{19}\,e/s$ $\quad I = 3.2\,A$

$I = 3.2\,A$

$I = \frac{\Delta Q}{\Delta t}$ $\quad Q = N_e e$

$Q = (2.0\times10^{13}e)(1.602\times10^{-19}C)$

$\Delta t = 1.0\times10^{-6}s$ $\quad Q = 3.2\times10^{-6}C$

$\Delta Q = 3.2\times10^{-6}C$

$I = 3.2\,A \;:\; I = \frac{3.2\times10^{-6}C}{1.0\times10^{-6}s}$

30.P.16 inner diameter $= 1.0\times10^{-3}\,m$

outer diameter $= 2.0\times10^{-3}\,m$

$I = 10A$

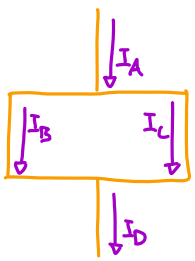
$J = \frac{I}{A}$

$A = \pi r^2$ $\quad A: A = ((1.0\times10^{-3})^2 - (.05\times10^{-3})^2)\pi$

$I = 10A$ $\quad J = I/A = 4.24\times10^{6}\,A/m^2$

$J = 4.24\times10^{6}\,A/m^2$

30.C.6



$I_A = I_B + I_C$

$I_D = I_B + I_C$

$I_B = I_C$

$I_A = I_D > I_B = I_C$